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A Proposed Morphological* Paradigm for an Orthogene

We thank the author and Gerard Killian, editor of The Journal for Anthroposophy in Australia, Winter—June 2011 edition, for permission to edit and re-publish.

These notes digest and rethink a talk at a Science conference supported by the Science group of the Anthroposophical Society of Great Britain in February 2011 in England, and of a three-day workshop in April 2011 at an Anthroposophical Society of Australia Conference in Sydney, Australia.

Both talk and workshop had the aim of considering a proposed core form architecture or morphology that is common to the four kingdoms of nature.

This hypothesis proposes a geometric basis for the mineral, vegetative—with a core verticality, early animalic—with a basic horizontality and a hint of the human—with verticality again, but inverted. All four are assumed to have some specific transformation of the tetrahedron as their form basis in the physical world.

Four Kingdoms

It is assumed here that there are *four* kingdoms visible in our physical world. That there is the *mineral*, the *vegetative*, the *animalic* and the *human*.

Fig 1: Four Kingdoms – *Mineral: a small carved stone symbolic tetrahedron (Neolithic from NE Scotland, approx 2,000 BC); Vegetative: a Casuarina's seed head (Australia); Animalic: a Komodo dragon (Indonesia); Human: a vertical human figure (Greece 570BC).*

The Mineral Kingdom

Tetrahedrons 'of the first kind'

This is hypothesised to be a regular tetrahedron (one case being the equilateral form), but of

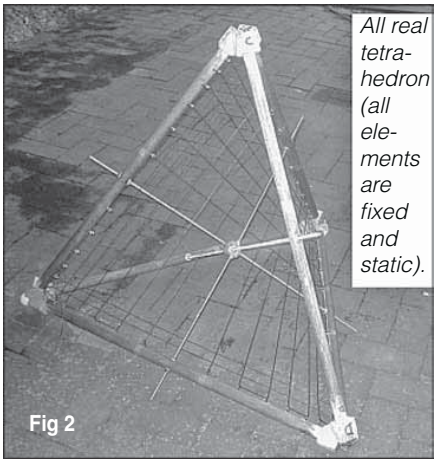
* Morphological implies having to do with form.
** Orthogenetic implies 'towards some end.'

John Blackwood,
Sydney, NSW, Australia

ɛtic** Evolution

infinite extent (or very, very large at least) that invokes parallelism. It might be thought of as even beyond the outer planets. To all extents and purposes it is infinitely large. Lawrence Edwards[1] said to me once that he had not found the all real tetrahedron (that is, all key elements are fixed, immobile, finite) in nature.

This got me thinking, because through his work it was quite clear that another tetrahedron *did apply to the plant world* and I could not see how such a basic form could apply to one kingdom and not to another. Hence this hypothesis.



All real tetrahedron (all elements are fixed and static).

Fig 2

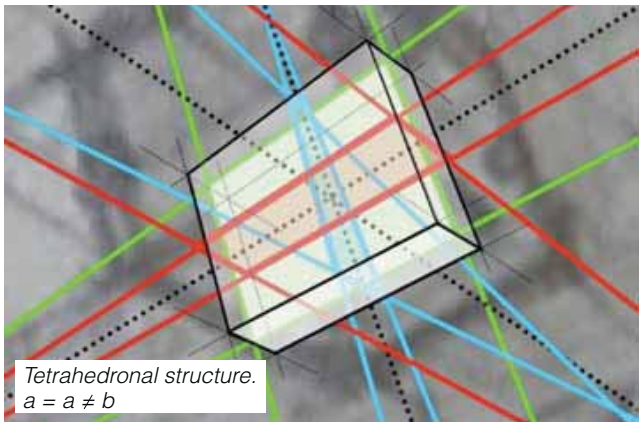
Measures and rhythms

Such a basis allows and presumes that *regularity* of measure (as is seen in much atomic structure) is necessary within all the six lines of this vast tetrahedron. Also that the spaces *within* this core structure are determined by the measures of planes and points in the six lines (or rays).

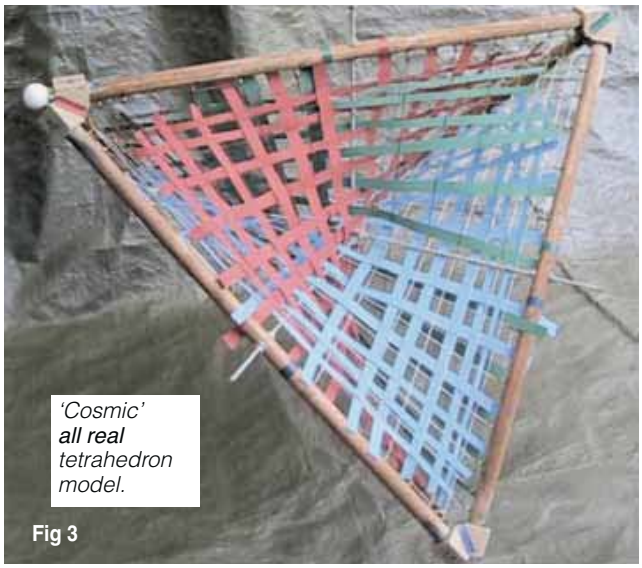
Transformations within the 'cosmic tetrahedron'

In the vast space encompassed by this (so to say) 'cosmic tetrahedron' the forms are all structured by the *path curves* and surfaces allowed by the geometry, and the measures and rhythms in it—and so they become linear. These forms—considering crystal structures only to begin with —arrange themselves into seven crystal systems (some say six only) and these are known as isometric, tetragonal, orthorhombic as well as hexagonal, trigonal, monoclinc and triclinic. Three of these can be arranged about *three mutually perpendicular axes*. This suggests inherent Cartesianism and rightly so I believe. Three of these crystal systems can be

1 Edwards, L. (1982) *The Field of Form*, Floris Books, Edinburgh



Tetrahedronal structure. a = a ≠ b



'Cosmic' all real tetrahedron model.

Fig 3

comprehended within an equilateral tetrahedron of vast extent. How is this so?

Cartesian axes within the tetrahedron

In 2008 I made a large model (fig 2). By making the *measures* along the six lines into *growth* measures rather than *equal* measures I was able to seemingly model an infinitely large tetrahedron (after a fashion!). This suggested that what was apparently flat in the local centre might in fact be a very, very gentle slightly curved surface. When we examine the model many things are revealed. One such aspect is that all the mutually perpendicular surfaces link up, via the lines, in a beautifully subtle way.

Three of the seven crystal classes

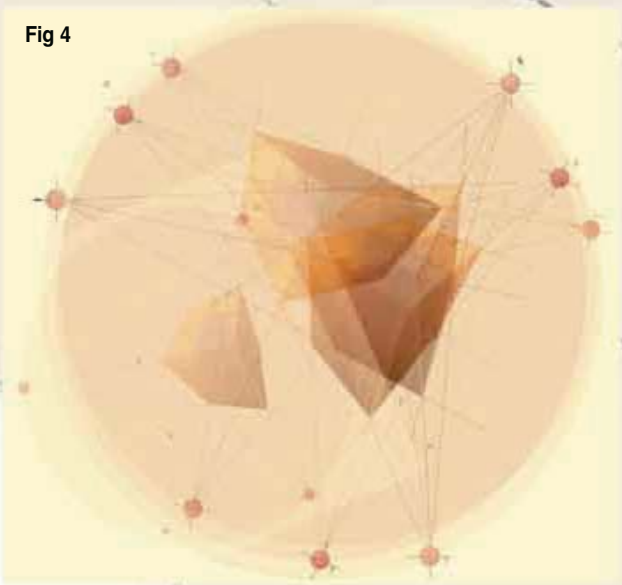
These three (isometric, tetragonal and orthorhombic) can be regarded as those which

can be structured around a 3D Cartesian architecture. How the other four systems intersect with this part of the story I have yet to figure out! Because even the hexagonal can be broken down into rhombic forms I believe this tetrahedral notion will eventually accommodate them too. This is all based on *unit cells*, initially discovered by René J. Haüy (1743-1822).

The rectangular prism within the tetrahedron

This turns out to be little more than constructing basic perspectives. But there is a twist—literally and physically. It can be seen how the rectangular crystals, which in themselves are highly ordered, each crystal is seemingly juxtaposed at complete random with respect to its neighbour. So all we do geometrically is to rotate the vast tetrahedron spherically somewhat to obtain another adjacent to it.

Fig 4



Intersecting and interpenetrating perspective crystals

This leads to a good exercise where one such rectangle 'crystal has been commenced. This was the first exercise of the workshop (see background, fig 4 on this page). The exercise gave an idea of how a hypothetical crystal form may be seen in the context of an infinitely large equilateral tetrahedron. We merely draw perspectives but with a twist, two or more twists in fact, depending on how many 'crystals' we wish to draw.

The vegetative kingdom

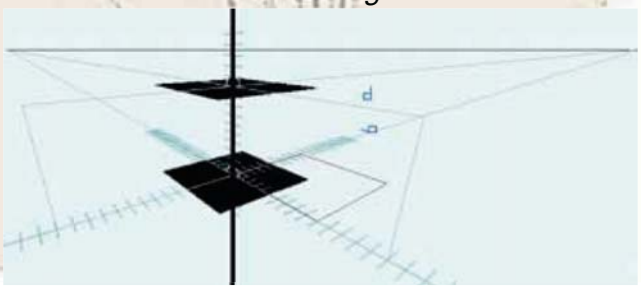
Tetrahedrons "of the second kind

The 'skeleton framework of the plant world is no longer hypothesised to be a *regular* tetrahedron of infinite extent but it is still a further special case of a tetrahedron (however odd it may look!).

Here the structure is both infinite and local (rather than wholly infinite in extent). It retains the line at infinity (horizontal) but now has a second line (at right angles to this line at infinity) and in the immediate local vicinity, and vertical, at right angles to the earth's surface. The other four lines are thought of as moving and in constant motion, two clockwise and two anticlockwise. This *still* makes six lines – as every tetrahedron must have – but only two of them are 'real', the other four are complex, imaginary and actively in motion.

Measures and rhythms

If *this* 'skeleton' is utilised as a framework for the vegetative then we find the measures are other than those for the mineral. No longer is there a regular equality everywhere but we find a *circling measure* in the line at infinity and a *growth measure* in the vertical local line. In the other four the measures are *geometric measures.*



Here are three different kinds of measure rather than the one kind in the mineral kingdom (equal measures). This leads to regular spirals in the two real planes and regular spiral cones in the two real points.

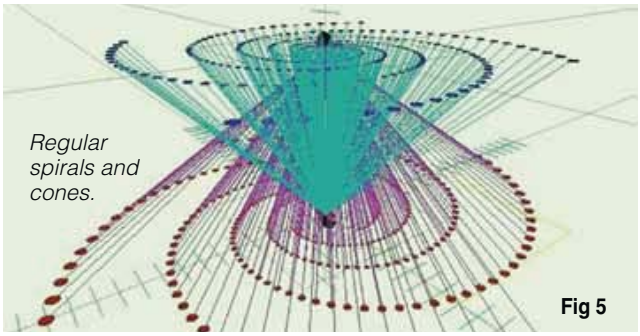


Fig 5

Transformations within the "cosmic/earthly tetrahedron"

In the vast space encompassed by this (so to say) cosmic/earthly tetrahedron the forms are again all structured by the path curves and surfaces allowed and the measures and rhythms in it—as they, again, have to be (if they are true to the laws of space). One set of these forms or surfaces are those of a convex, even bud-like nature, fig 6 (another set are of a vortical-vortex nature).


Fig 6

This time however the forms within and around this tetrahedron are not linear, even remotely. They exhibit curvatures of all kinds yet all with a basic plan, as Lawrence Edwards[2] discovered, that is common—even archetypal— or so I would claim. His work is the basis for the tetrahedron that circumscribes the plant forms—an example of his work is shown below.

Examples of bud-like forms

Examples of this form expression are numerous, and very, very widespread—even ubiquitous!

Fig 7

2 Edwards, L. (1993) *The Vortex of Life*, Floris Books, Edinburgh

There are the legions of pine cones, seed heads of countless plants, the flesh of the pineapple, the huge seed cones of the bunya pines, the buds on all the oak trees in both the hemispheres!

The plant, of course, is far more than this—but it might be a morphological beginning to one aspect of its architecture. 17 year olds can draw these curves without too much difficulty.

Another exercise was done in the workshop using the double cone and the spiral framework. This tried to show how we can construct at least one single path curve (or a family of them) in this particular, very special kind of tetrahedron—It is worth noting that, when viewed from above, all these forms have radial symmetry, a plant signature and give a bud, or egg-like profile when viewed from the side.

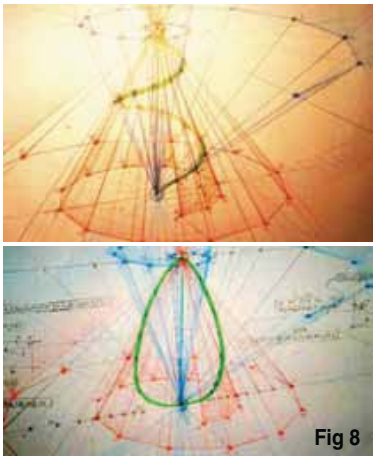


Fig 8

Side view of the whole field spiralling path curves.

Early Animalic Kingdom

The early animalic tetrahedron—are there Tetrahedrons 'of the third kind'?

For the early animalic one could hypothesise that one of the lines of the tetrahedron carries the spine. This is a crucial assumption. This means that the vertically oriented stem or 'spine' of the plant has turned through ninety degrees to become the horizontally oriented animal spine. For the plant, one of the tetrahedron lines is the line at infinity, so where does this go for the animalic? I contend that it slowly comes in from the infinite—from above, I suspect (but it may be from below)—to varying degrees and, like the spine, lies horizontally but probably somewhat distant from the spine and perpendicular to it.

So for the animalic both these two real lines are now local—and neither is any longer infinitely distant. With each new kingdom there seems to be a leap in from the far cosmos towards the increasingly local and immediate.

The measures and rhythms

If this new 'skeleton' is utilised as a framework for the early animalic then there will also be measures and rhythms of course. Something new cometh out. We now discover a non equal circling measure in the new horizontal local line above the horizontal spinal line. In this horizontal real line is a growth measure with a point focus at the head end and a focus point at the tail end of the "fish". This latter is similar to the plant structure but perpendicular to it. There is much more to this perpendicularity business than meets the eye!

Transformations within the 'local earthly tetrahedron'

In the local space determined by this local fishy tetrahedron the *path curves* and surfaces allowed and the measures and rhythms in it are again modified, even metamorphosed. The clue for me in this was the similarity between the pineapple or pinecone or protea layout on the surface of the plant form. If such artefacts are made *horizontal* then it could look somewhat like—a fish! There is even a *pineapple* fish (so called [see fig 9]) to be found, see illustration, Japanese version! There seems to be a high regularity in the layout of the *scales*—not the painted colours—on many a fish.

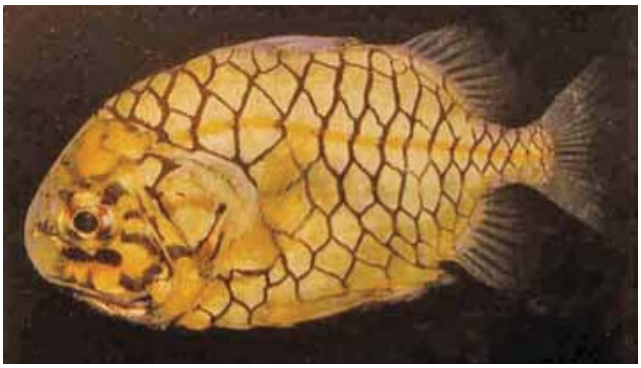


Fig 9: *Japanese pineapple fish.*

Fig 10: *Carp.*

The path curves are now of a *spiroid* nature (i.e. 'like unto a spiral, but asymmetric'). Do these curves map into the pattern of the surface scales of the fish?

At this stage I have only had time to look at the carp (fig 10). Why this fish? Because the scales are large, it is a beautiful fish, the *lateral line* is almost straight, where this line is very clearly marked on a horizontal line of scales), and I make the (uneasy) assumption that this line mirrors, at least approximately, the position of the spine inside the fish. For many fish this lateral line is not straight at all but that is research for another time (perhaps another paradigm?).

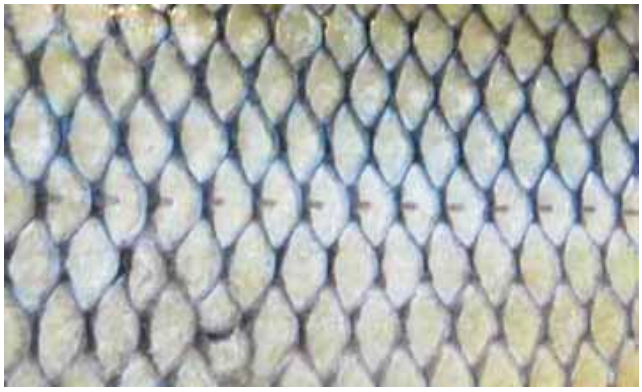


Fig 11: *Lateral line clearly marked along the scales on the side of the carp body.*

After examining orthographic views of this creature and applying the geometry of possible spiroid architectures I came to the possibility (after very many trials) that much of the carp skin surface could be described by a beautiful encompassing curve passing through the centres of the scales. It was a reasonably good first estimate, in my opinion, and has been an encouraging start to exploring the possibility of a fish morphology that was not merely descriptive but had an inherent geometry and could thus be placed in some kind of extensive *form field*[3]—its full nature to only be determined by *much* more research!

The notion of form fields is fairly well established through Edward's work for the plant world but to get to the animalic world is another step. I had to think that there must be a further 'Tetrahedron of the *third* kind', which transitioned from the 'second kind'. But I have not yet found it. It would have to embrace the morphology belonging to *soul, consciousness* and *sentiency* …

An exercise was proposed for the workshop but we never got to it. If pursued it would have led to such as fig 12 describing the basic scale pattern.

3 Edwards, L. (1982) *The Field of Form*, Floris Books, Edinburgh

The fish as a primary evolutionary form

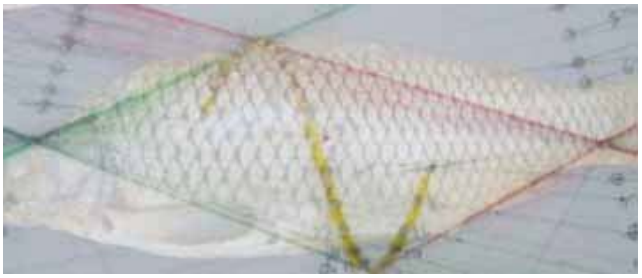


Fig 12: *Scale pattern on the carp skin.*

It was also encouraging to note—from talking to Neil Carter, a teaching colleague from New Zealand—that there was apparently a conversation between Alfred Meebold (botanist, writer and anthroposopher) and Rudolf Steiner, where he apparently spoke of the fish as a primary evolutionary form for the animalic kingdom and not one or another of countless possible invertebrates. An archive search at Dornach has so far (April 2011) failed to find the details but the search will continue!

The Human Kingdom?

Is there a Tetrahedron "of the fourth kind"?

Apart from a few clues I have not got far with this. It would seem there has to be one such form but one has to be very careful about extrapolating too readily. One such clue is that the human stance, seen from the front (and back) is—or should be—straight. Is this just one real line (or curve) of the tetrahedron belonging to the human? ◆

John Blackwood, mathematician and researcher, previously taught at Glenaeon Waldorf School in Sydney, and continues to give lectures and workshops on his specialist subjects. His research work continues in mathematical/morphological studies. John worked collegially with Laurence Edwards for several years. John's books on teaching mathematics in class seven and eight have,in 2011, been combined into one volume.* **Editor NC**

* eg Blackwood, J (2006) *Mathematics Around Us* – a teachers resource book for Mathematics which covers mathematics in Nature and Pythagoras and Numbers : Floris Books, Edinburgh

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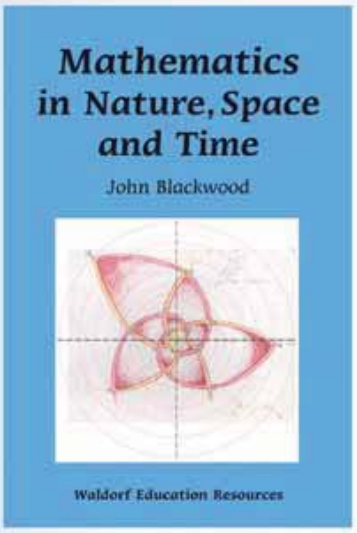

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John Blackwood worked in mechanical engineering design for nearly 30 years and was inspired by Lawrence Edwards' work with plant geometry. He became a teacher at the Glenaeon Rudolf Steiner School in Sydney, Australia. There he designed a maths course for Classes 11 and 12 which was sanctioned by the Board of Studies of New South Wales. He lives near Sydney.

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